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Roll No. 1863102 Total No. of Pages : 3

BT-2 / J04 **8225**

CH-101E : Chemistry

Time : 3 Hrs. Aggarwal Jagadhri **M.M. : 100**

Note : Attempt five questions in all, selecting atleast one from each Unit.

UNIT - I

I (a) Calculate the standard free energy change for the reaction.

$$4NH_3(g) + 5O_2(g) \longrightarrow 4NO(g) + 6H_2O(l)$$

The standard free energies of formation ($\Delta G°f$) for $NH_3(g)$, $NO(g)$ and $H_2O(l)$ are -16.8, $+86.7$ and $-237.2 kJmol^{-1}$ respectively. 5

(b) The latent heat of vaporisation of water is 540 cal gm^{-1} at 100°C. Calculate the pressure at which water must be heated to produce superheated steam at 150°C. 5

(c) Explain the concept of chemical potential. 5

(d) Derive an expression for Gibbs-Helmholtz equation. 5

II (a) Giving examples, explain the term : Components of a system. 5

(b) Differentiate between True Equilibrium and Metastable Equilibrium. 3

(c) Justify the statement, "The Eutectic is a mixture and not a compound". 6

(d) What is the principle of sublimation ? Discuss its application in Freeze Drying. 6

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UNIT - II

III (a) A water sample contains the following impurities : Ca^{2+} 20 ppm, Mg^{2+} 18 ppm, HCO_3^- 183 ppm and SO_4^{2-} 24 ppm. Calculate the amount of lime and soda needed for softening. 6

(b) Define alkalinity. How is it determined ? 4

(c) Write the names of three sludge-forming and three scale-forming compounds. 3

(d) Write the names of various methods for scale prevention. Describe phosphate conditioning in detail. 2,5

IV (a) What are Ion-Exchange Resins ? Discuss their application in water-softening. How are spent resins regenerated ? 2,4,2

(b) With the help of a neat diagram, explain the use of Electrodialysis for desalination of water. 8

(c) Name eight methods for disinfection of water. 4

UNIT - III

V (a) Discuss the role of nature of oxide formed in oxidation corrosion. State and explain Pilling-Bedworth rule. 4,2

(b) Describe the mechanism of Electrochemical corrosion. 6

(c) Write short notes on : 4x2

(i) Pitting Corrosion

(ii) Role of Sacrificial Anode in Corrosion Control

VI (a) What is Frictional Resistance ? Why is it desirable to reduce it ? In what ways can it be achieved ? 6

(b) Describe the mechanism of Boundary Lubrication. 5

(c) Describe Four important additives for Lubricants. 4

(d) Describe the penetration test for greases. What is meant by consistency ? 3,2

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UNIT - IV

VII (a) PVC is soft and flexible where as Bakelite is hard and brittle. Give reasons. 5

(b) What are the chief physical characteristics expected of an elastomer ? How are these achieved in a new product ? 5

(c) Describe the preparation and technical applications of Silicone Fluids. 8

(d) What is meant by copolymerisation ? 2

VIII (a) What are the advantages of conductometric titrations over ordinary titrations using indicators ? 5

(b) Discuss the principle involved in flame photometry. Give a brief account of its applications. 2,5

(c) What is spectrophotometry ? Discuss the principle and working of a spectrophotometer with the help of a schematic diagram. 8